Port of Seattle
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Port of Seattle

Transmittal

February 20, 2018

To: National Remedy Review Board
c/o Ravi Sanga
Environmental Protection Agency
1200 Sixth Avenue
ECL-111
Seattle, Washington 98101

From: Port of Seattle

Cc: S. Blocker, U.S. EPA Region 10
S. Bilbrey, U.S. EPA Region 10
C. Hladick, U.S. EPA Region 10

Re: East Waterway Operable Unit of the Harbor Island Superfund Site

The East Waterway Group (EWG), consisting of the Port of Seattle, the City of Seattle, and King County, has developed this potentially responsible parties' technical comment submission to the National Remedy Review Board. This document package is submitted in advance of the NRRB meeting on March 20, 2018, for consideration in reviewing the remedial alternatives for the East Waterway Operable Unit of the Harbor Island Superfund Site. This technical comment submission contains the following:

- Cover letter from the Port of Seattle
- Cover letter from the City of Seattle
- Cover letter from King County
- Technical Memorandum from EWG Re: East Waterway Remedy Selection Recommendations

Port of Seattle

February 12, 2018

National Remedy Review Board
C/o Ravi Sanga
Environmental Protection Agency
1200 Sixth Avenue
ECL-111
Seattle, WA 98101

Re: East Waterway Operable Unit of the Harbor Island Superfund Site

Dear Remedy Review Board Members:

On behalf of the Port of Seattle, I am writing to provide information for your consideration in your review of EPA Region 10's draft proposed remedy for the East Waterway Operable Unit of the Harbor Island Superfund site ("EW"). I am including, along with this letter, the memorandum, East Waterway Remedy Selection Recommendations, to consider when evaluating EW remedy options. Also included is a brief history of the EPA Superfund Program's involvement with the Harbor Island Waterways, and information on the Port of Seattle and the groundbreaking brownfields and other work the Port has done in collaboration with the EPA Superfund Program over the course of the last 25 years.

This letter will highlight the major points in the attached package of information. The key message is that, after 20 years of Port-led site investigation and analysis work in cooperation with Region 10 directed at a one-mile-long commercial waterway, and well over three decades after Harbor Island was placed on the National Priorities List, the time has finally come to move expeditiously forward with a final remedy decision that uses proven technologies to address site risks in a pragmatic, implementable fashion. Although we have not seen Region 10's recommended remedy, we believe that the reasonable and practicable remedy options fall within such a narrow band that the choices are obvious. There is no need to introduce unnecessary new levels of complication, including future pilot studies or costly and dangerous measures that have not been shown to reduce risk. The Port of Seattle, as a cooperative PRP that has for nearly 20 years taken the lead among EW PRPs in collaborating with Region 10's Superfund Program to produce high quality work, is not asking for any favors or reductions in levels of protection – we are simply asking for a final EW remedy that makes sense.

Port of Seattle's Cooperative Approach and High Quality Work

As you may know, the Port of Seattle is the sole respondent on the 2008 Administrative Settlement Agreement and Order on Consent ("ASAOC") under which the Supplemental Remedial Investigation was completed and the Feasibility study was performed. What you may

not know is that the Port first signed onto a CERCLA administrative order for supplemental remedial investigation work in 1998, when the Port brought together a group of Harbor Island property owners to perform additional site investigation work after EPA concluded that the Fund-lead Remedial Investigation and Feasibility Study performed by EPA's contractor was fundamentally flawed. Since that time, efforts led by the Port, or carried out solely by the Port, have produced high-quality work that has been accepted by EPA and used to reach the following site milestones: the 2003 West Waterway ROD; the EW non-time-critical removal action ("NTCRA") performed by the Port in 2004; and the recently-completed EW Supplemental RI/FS.

The Port's EW NTCRA resulted in the removal of 260,000 cubic yards of contaminated sediments from the portion of the EW that had the highest concentrations of hazardous substances that could be addressed without impairing structures. It was an example of the Port's willingness to take early actions to reduce risks at a sediment site; an approach that comports with EPA's emphasis on early actions and adaptive management for contaminated sediment sites. That emphasis, which has long been included in EPA guidance documents, has recently been reiterated and highlighted in the January 9, 2017 sediment sites memorandum from Mathy Stanislaus to EPA's Regional Administrators, and in the July 15, 2017 recommendations of EPA's Superfund Task Force.[1]

The recently-concluded SRI/FS work carried out under the EPA/Port ASAOC, with the participation of the City of Seattle and King County, culminates a process that has included multiple administrative orders and multiple successful Port efforts to bring other parties to the table to assist with funding that work. The completed work is the result of nearly 20 years of back-and-forth with EPA Region 10 concerning the required scope of supplemental analysis beyond the work done by EPA's contractor, along with much discussion and analysis concerning the appropriate interpretation of the work that was done. In short, the Port has taken the leading role, under EPA's oversight, in all of the EW work performed by PRPs over the course of the very long and very circuitous trip from Harbor Island's initial listing as an NPL site on September 8, 1983 up until today, when you have before you a final SRI/FS and Region 10's recommendation for a final site remedy. In fact, the Port has not only been cooperative with

[1] EPA, *Superfund Task Force Recommendations*, July 25, 2017, *available at*: https://www.epa.gov/sites/production/files/2017-07/documents/superfund_task_force_report.pdf (recommending "use of removals or early actions to quickly address high risk areas" under "an Adaptive Management strategy"); EPA, *Memorandum Subject: Remediating Contaminated Sediment Sites - Clarification of Several Key Remedial Investigation/ Feasibility Study and Risk Management Recommendations, Updated Contaminated Sediment Technical Advisory Group Operating Procedure*, Mathy Stanislaus, Office of Land and Emergency Management, SEMS Doc ID 196834, January 9, 2017, *available at*: https://semspub.epa.gov/work/HQ/196834.pdf ("Consider early actions . . . to help reduce risks quickly.").

respect to the various Harbor Island Operable Units, it has collaborated with EPA at multiple Superfund sites in innovative ways that ultimately helped lead to changes in EPA policy.[2]

The EW is a Major Component of the Nation's International Trade Infrastructure

Unlike other major CERCLA sediment sites in the Northwest, the shoreline of the EW is devoted almost entirely to a single use—deep-water marine cargo terminals. Extremely active Port of Seattle container terminals are located along the entire western shore of the EW and along much of its eastern shore. In 2016, cargo valued at over $14 billion moved across the Port's shipping terminal docks, the vast majority of which border the EW. A final remedy that accounts for that use, and recognizes the difficulties inherent in working in a federally-designated navigation channel that accommodates a huge volume of shipping, is essential.[3] An effective and practicable remedy that can be implemented in a straightforward fashion without further studies and without impairing current EW uses is available and should be chosen.

Key Questions the ROD Must Answer

The FS is built around a series of remedial alternatives that differ primarily in how they answer three key questions:

- Should active removal remediation underneath shipping terminal piers be required?
- What remedial action level should be used for PCBs?
- Should use of capping or enhanced natural recovery be emphasized in areas where those technologies would not interfere with the EW's use as a shipping channel?

Fundamental remedy selection principles dictate the answers to these questions. ***More costly, time-consuming and difficult remedial options should not be chosen if FS analyses do not demonstrate that they will reduce human health or environmental risks.***

Diver-Assisted Dredging under Piers Should Not be Included in the Proposed Plan

[2] See attached history of the Port's cutting-edge brownfields work on the Southwest Harbor Project, (including remediation of the Pacific Sound Resources site under a creative prospective purchaser/trust arrangement), and on the Harbor Island Soil and Groundwater Operable Unit and Terminal 18 redevelopment project (which was awarded an EPA Brownfields Program Phoenix Award in 2004).

[3] The January 2017 memorandum from Mathy Stanislaus to EPA's Regional Administrators cited above recommends considering "authorized navigation channels" when "evaluating remedial alternatives and selecting a remedy," and cautions against impeding "the navigable capacity of the channel."

The EW OU includes steep riprapped slopes located underneath shipping terminal piers. Limited sampling of the thin layer of sediment that has accumulated on these steep rocky slopes indicates that some of the under-pier sediments exceed both of the potential PCB Remedial Action Levels (RALs) for the site. Some of the FS alternatives would address those areas by sending divers underneath the piers armed with hydraulic dredging equipment to remove whatever sediments they could access with a hand-held suction hose. Diver-assisted dredging under piers should not be included in the EW Proposed Plan and ROD because it is extremely dangerous to workers, has not been shown in the FS analyses to reduce site risks, and is unnecessarily costly.

As recognized in the Final FS, and by the Suquamish Tribe in their comments on the draft FS,[4] diver-assisted dredging underneath piers is dangerous because of the difficulties of working in areas with structural cross-bracing, cables, and accumulated debris. Divers would have to move into confined spaces without tangling hoses and support equipment, and would be operating in the dark in a cloud of sediment disturbed by their own hydraulic dredging efforts. Risks to divers working around structures are generally high, and would be extreme in this context.[5] Further, diver-assisted dredging underneath the actively-used EW piers would be fraught with other difficulties, as hydraulic dredging generates large volumes of water and there are no available nearby upland areas where dewatering and water treatment could take place.

Balanced against the dangers and difficulties of diver-assisted dredging is the potential to reduce site risks by removing at least some of the sediments located under the piers that exceed the PCB RAL. However, FS analyses demonstrate that no risk reduction would result. Although this may seem counter-intuitive, the volume of sediments underneath the piers is relatively small compared to the open water areas, and a certain amount of exchange with open water sediments occurs as a result of vessel activity. FS analyses concluded that this sediment exchange should result in an equilibration of under-pier sediments with remediated channel sediments over time, without the need for putting workers at risk.

A remedy technology that is dangerous to workers, is extremely difficult and expensive to implement, and will not decrease human health risks in the long term, cannot be chosen as a component of a practicable, implementable site remedy.

The EW Remedy Should Use the Same PCB RAL as the Lower Duwamish ROD

EPA chose a sediment PCB RAL of 12 mg/kg OC for the Lower Duwamish Waterway site, located immediately upstream of the EW. The EW Feasibility Study includes remedy alternatives that use a significantly lower RAL for PCBs (7.5 mg/kg OC). FS evaluations

[4] "The use of diver assisted hydraulic dredging option should not be included as it is dangerous and is not cost effective or efficient (leaves significant amounts of contamination behind and is time intensive)." Comment 9, Suquamish Tribe Comments to EPA, March 8, 2017.
[5] *See* EW FS Section 7.2.6.3; *see also* OSHA, Commercial Diving Safety, *available at*: http://www.osha.gov/archive/oshinfo/priorities/diving.html.

demonstrate that use of the lower PCB RAL would increase costs and extend the time required to complete site cleanup, but would not result in reduced human health risks or provide greater certainty that predicted risk reductions would be achieved.[6] The EW Proposed Plan and ROD should use the same PCB RAL as the Lower Duwamish site, as there is no basis for choosing the lower value.

Lower-Cost Technologies that Address Risk Without Impairing EW Uses Should be Applied

The FS correctly identifies navigation and maritime shipping operations as important current and future uses of the EW. Consistent with those uses, capping and enhanced natural recovery (ENR) options have not been included as remedy options for areas where use of those technologies would interfere with efforts to maintain required shipping depths. However, for areas where capping or ENR can effectively reduce risks and would be consistent with current and reasonably anticipated future uses of the EW, EPA should adopt one of those lower-cost options.

Use of capping and ENR technologies, where appropriate, is consistent with the more streamlined, results-oriented approach that EPA is seeking to implement at major contaminated sediment sites. In contrast, an approach that seeks to maximize mass removal, despite a lack of demonstrable risk reduction, unnecessarily drives up costs, delays cleanup and increases short-term risks. The preferable approach makes use of all three remedial technologies included in the FS (dredging, capping and ENR) in a fashion that is consistent with the EW's current and long term use for marine cargo-related activities, while also providing risk reduction.

EPA Should Move Ahead Expeditiously to Select a Protective and Practicable Remedy

Recommendation #1 of EPA's Superfund Task Force is to "target NPL sites that are not showing sufficient progress." Sites to be "target[ed] for completion" include those that have been listed on the NPL for five years without a selected action. The Task Force's recommendation for those sites is to "find obstacles to completion and address them." As an operable unit of a site that was included in the very first set of sites placed on the National Priorities List over 34 years ago, it is well past time to remove obstacles to completion and move ahead with an EW remedy that is both protective and practicable.

At this point in time, there are few obstacles to moving ahead with an implementable remedy that meets CERCLA requirements. The site FS demonstrates that nearly all of the active remedy options reduce risks to a comparable degree. EPA should move ahead with a straightforward remedy choice that does not include extras that have not been shown to reduce risk, such as

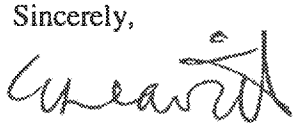
[6] Extensive sensitivity analysis conducted for the FS showed that the most sensitive parameter affecting the likelihood of achieving predicted risk reductions is the contaminant concentration in incoming sediment from the Green River, which affects the RAL alternatives (12 vs. 7.5) equally. *See* FS Appendix J, Figure 4b.

diver-assisted under-pier dredging or a PCB RAL that is lower than the RAL recently chosen for the immediately-upstream sediment site.

The Port hopes to continue to assist EPA as a highly cooperative PRP that performs timely, high-quality work. A final remedy choice that is both protective and practicable will facilitate the Port's efforts with other PRPs and go a long way towards ensuring that the remedy can be implemented in a timely fashion.

Thank you for your consideration of the Port's comments. We look forward to continuing to work with EPA as the agency carries out its Superfund responsibilities for the East Waterway site.

Sincerely,



Elizabeth Leavitt
Sr Director Environment & Sustainability
Port of Seattle

cc:
S. Blocker, US EPA Region 10
S. Bilbrey, US EPA Region 10
C. Hladick, US EPA Region 10

Port of Seattle's Brownfield Cleanup Sites

Below are two examples of the how the Port of Seattle has collaborated with EPA on various Brownfield cleanup sites.

Southwest Harbor Cleanup and Redevelopment Project,

The Southwest Harbor Cleanup and Redevelopment Project took the existing 100 acre Terminal 5 cargo container facility and expanded it by 100 acres by acquiring and remediating over 15 industrial highly-contaminated properties that included ship building, wood treating , steel mill, municipal landfill, scrap metal and rail yard operations. The remediation work, which was completed in under four years, was carried out in conjunction with a shipping terminal expansion that added a new on-dock intermodal rail yard and greatly expanded Terminal 5's capacity. Integral to the completion of a project of this magnitude in such an expedited timeline were strong partnerships that included, the Port, terminal tenant, US EPA, Army Corp of Engineers, Washington State Dept of Ecology and the local community.

The Southwest Harbor Cleanup and Redevelopment Project required the acquisition, closure and remediation of a wood treating facility (Pacific Sound Resources) that had been in operation since 1908. This was accomplished through the use of an innovative prospective purchaser arrangement that involved the company shutting down and placing all of its assets in an environmental trust, with those resources being devoted to remediation of its various facilities. The Port acquired and remediated the upland portion of the facility under an arrangement that put the property's "as if clean" purchase price into the environmental trust and obligated the Port to perform additional in-kind cleanup work. The upland remediation work was performed by the Port under an Administrative Order on Consent following listing of the site on the National Priorities List (NPL) in 1994. The contaminants of concern included PAHs, PCP and metals. Altogether, the Port's cleanup work for just the PSR portion of the Southwest Harbor Cleanup and Redevelopment Project totaled around $20 million.

The EPA/Port arrangements for the PSR site were groundbreaking in many ways. Site remediation responsibilities were divided between the Port and EPA for what would otherwise have been a fund-lead site. The Port completed upland soils cleanup actions and the groundwater RI/FS and EPA was responsible for completing the groundwater and sediment remedy. The cleanup maximized usage of EPA's Early Action Authorities and Superfund Accelerated Cleanup Model. The Port completed disposal of hazardous waste and process residual sludge from wood treating plant demo, installation of a "cut off" slurry wall to prevent release to the bay, installation of a LNAPL recovery system, import of clean material and an installation of an environmental cap. All remedies are currently functioning as designed and are protective of human health and the environment.

Harbor Island Soil and Groundwater Operable Unit and Terminal 18 Redevelopment Project

In 1991, the need for area to expand marine cargo handling facilities on Harbor Island initiated redevelopment planning. The main project goals were to improve container cargo shipping capacity, cleanup existing contamination, increase intermodal rail capacity and create new jobs.

The resulting plan for the Terminal 18 expansion increased the size of the existing facility from110 acres to 200 acres.

Terminal 18 is located on Harbor Island, which was listed as an NPL site in 1983, and had 80 years of past industrial activities that resulted in elevated concentrations in soil of contaminants such as lead, mercury, arsenic, petroleum PAHs and PCBs. The cleanup approach consisted of excavation, treatment or offsite disposal of soil, capping exposed contaminated soils exceeding cleanup goals, removal and treatment of LNAPL, implementation of institutional controls and a 30 year groundwater monitoring program.

The Harbor Island cleanup was complicated by the fact that a large portion of the island was divided into small parcels with a wide variety of owners and uses. The Port spearheaded an effort that resulted in an agreement among all of the owners of property where remediation was required. This agreement allowed parties to sign up to a standard EPA consent decree without fear that they would be held responsible for contamination elsewhere on the island that they did not cause. Because EPA was moving towards a consent decree for the Harbor Island upland operable unit at the same time as the Port was planning property acquisition and a major terminal expansion, the framework created by the Port was critical to moving forward in an orderly fashion with both the cleanup and the property purchases needed for the Port's Terminal 18 project. Under the agreement amongst the PRPs, and through arrangements worked out with EPA, properties not part of redevelopment could perform their own expedited cleanups, while remediation of properties included in the redevelopment could occur in conjunction with the terminal expansion project.

The Port and EPA were able to establish Site remedial designs to generate work plans that established procedures for hot spot cleanup and capping thereby eliminating need for individuals to develop their own work plans for small hotspot cleanup and capping. Plans were also developed for addressing hot spots identified during the Terminal 18 redevelopment phase. The result of the Port's collaboration with EPA and with the other PRPs was that the remedy was implemented quickly and efficiently with little or no controversy.

Various Environmental benefits included the following:

- Removal of 8,000 tons of contaminated soils
- Reduce runoff and groundwater impacts to adjacent aquatic environments (East Waterway).
- Relocated businesses were upgraded to meet new environmental standards
- Air quality improved as a result of reduced traffic congestion and truck trips.

All remedies are currently functioning as designed and are protective of human health and the environment. The expansion project was awarded an EPA Brownfields Program Phoenix Award in 2004.

City of Seattle
Seattle Public Utilities

February 7, 2018

U.S. EPA National Remedy Review Board and
Contaminated Sediments Technical Advisory Group
c/o Ravi Sanga
U.S. EPA Region 10
1200 6th Avenue
Seattle, WA 98101

RE: Identification of EPA's Preferred Remedy:
Harbor Island Superfund Site - East Waterway Operable Unit

Dear Board and Advisory Group Member:

After more than ten years of investigation and planning, the East Waterway (EW or waterway) Operable Unit of the Harbor Island Superfund site is at a critical decision point regarding how the waterway will be cleaned up. The remedy selected by the U.S. Environmental Protection Agency (EPA) will have lasting effects on the environmental quality of the waterway, tribal fishing interests, regional commerce, and the natural resources found in and along the waterway. The City of Seattle (the City) appreciates the opportunity to provide comments to the EPA National Remedy Review Board (NRRB) and Contaminated Sediments Technical Advisory Group (CSTAG) as they review the proposed remedy for the site.

The EW is a 1.5-mile-long, 157-acre maintained waterway in one of Seattle's primary industrial and commercial areas. The EW is located immediately downstream and north of the Lower Duwamish Waterway (LDW) Superfund site, along the east side of Harbor Island and is one of the most active commercial waterways in the Pacific Northwest, supporting a variety of shipping and water-based industries. The Duwamish industrial corridor, including EW, provides about 100,000 jobs to the region.

The EW shoreline is highly developed with a limited number of small intertidal areas. Despite the commercial use and structures, the EW contains diverse aquatic and wildlife communities, including marine mammals and birds. The EW provides habitat important to various species including Puget Sound Chinook salmon and bull trout. Although there are few public access points to the EW, it is used for various recreational activities such as boating and fishing. The EW is part of the Muckleshoot Tribe's and Suquamish Tribe's usual and accustomed areas, which provides these tribes with treaty-protected uses including a commercial fishery for salmon as well as ceremonial and subsistence uses.

The City's objectives are to provide for the long-term health of the environment and natural resources found in and along the waterway; to ensure public funds are well spent on appropriate cleanup approaches; to avoid unnecessary implementation risks to workers; and to preserve jobs and commerce in this bustling part of the City.

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The remainder of this letter briefly summarizes recommendations that the City strongly believes should be considered during EPA's identification of a preferred remedy. In addition, to help the NRRB and CSTAG better appreciate the City's input regarding the cleanup, this letter summarizes the City's overall commitment in the EW and LDW corridor to strong environmental protection and restoration, social and environmental justice, and wise investments of our utility ratepayer's dollars.

Recommendations for Identification of a Preferred Remedy for EW

The Final Feasibility Study (FS) for the EW was submitted to EPA for approval in November 2017. The FS is the culmination of over a decade of work and was developed by the East Waterway Group (EWG; Port of Seattle, City of Seattle, and King County) in close coordination with EPA, incorporating input from state agencies and affected Indian Tribes. Attached to this letter is an EWG-prepared memorandum that identifies three recommendations and one regulatory consideration the City believes should be considered during EPA's identification of a preferred remedy:

1. **The total polychlorinated biphenyl (PCB) Remedial Action Level (RAL) of 12 mg/kg organic carbon (OC) should be selected over the RAL of 7.5 mg/kg OC.** An alternative with a 12 mg/kg OC total PCB RAL is the most appropriate choice for a preferred remedy. Selection of a (12) RAL set results in the same risk reductions without additional unnecessary short-term impacts and costs. This is consistent with the conclusions from other sediment cleanup sites in Puget Sound: the 12 mg/kg OC total PCB RAL was selected for the adjacent LDW Superfund site.

2. **Underpier diver-assisted hydraulic dredging should not be a component of the preferred remedy; in situ treatment should be used for remediating underpier sediments if active remediation is necessary under the piers.** One of EPA's Principles is that remedies should be selected that minimize short-term risks while achieving long-term protection. The short-term risks (worker safety) and costs are too high for diver-assisted hydraulic dredging, without any impact on site-wide risk reduction. In addition, there is uncertainty that diver-assisted dredging will be effective in removing contaminated sediment in the complicated underpier setting. A "B" alternative should be selected over a "C+" or "E" alternative if active remediation is necessary under the piers.[1]

3. **A combination of open-water remedial technologies (i.e., dredging, capping, and enhanced natural recovery [ENR]) should be included in the preferred remedy.** An

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[1] Remedial alternative nomenclature is described in FS ES Table 3 of the attachment to this letter. The A/B/C/D nomenclature identifies technologies for restricted access areas (under piers and low bridges):

- "A" specifies monitored natural recovery
- "B" specifies in situ treatment
- "C+" specifies diver-assisted hydraulic dredging where elevated PCBs or mercury are present followed by in situ treatment elsewhere
- "E" specifies diver-assisted hydraulic dredging in all areas followed by in situ treatment.

The 1/2/3 nomenclature identifies remedial technologies for open-water areas:

- "1" specifies removal with capping and enhanced natural recovery where applicable
- "2" specifies removal with capping where applicable
- "3" specifies removal to the extent practicable.

alternative with Option 1 or 2 is the most appropriate choice for a preferred remedy. These alternatives offer better cost-effectiveness than Option 3 because of similar risk reduction, but lower short-term impacts and costs.

4. **All FS action alternatives comply with the Washington State Sediment Management Standards (SMS) applicable or relevant and appropriate requirement (ARAR).**

In particular, regarding item 2 above, the City wants to emphasize our concerns about identification of a preferred remedy that includes underpier diver-assisted hydraulic dredging. Given there is no additional reduction in risk with underpier dredging compared to other remedial technologies (e.g., in situ treatment), it is not reasonable to put divers at significant risk of injury or death, or expend public funds on this ineffective remedy component.

Commitment to Strong Environmental Protection and Restoration

The City has a long history of aggressively pursuing environmental protection and restoration in the LDW/EW corridor and the City in general. This history includes leadership in contaminated site cleanup, sediment source control, protection and improvement of Seattle's water bodies, habitat restoration, water quality improvements, compliance with wastewater and storm water permit requirements, and supporting advancement of Puget Sound Partnership (PSP) goals and activities.

Contaminated Sediment Cleanup

The Supplemental Remedial Investigation and Feasibility Study (SRI/FS) for the EW were conducted by the EWG. The Port entered into the Administrative Settlement and Order on Consent for the SRI/FS with EPA in October 2006 and subsequently entered into a Memorandum of Agreement with the City and County to jointly conduct and fund the EW SRI/FS.

The City is a signatory to the Administrative Order on Consent (AOC) for the LDW RI/FS, and is continuing its partnership with other PRPs and EPA as we work toward implementation of EPA's selected remedy. In addition, the City led the early action sediment cleanup at Slip 4 of the LDW, and recently completed an early action at Terminal 117 in partnership with the Port of Seattle. The City is especially proud of its work at Slip 4, which was completed in 2012. The Slip 4 cleanup reflected a public engagement process that began early and, through open and transparent interaction with stakeholders, ended with broad support for the final design. The cleanup at Slip 4 addressed a PCB hot spot in the LDW and was a key stepping stone toward the larger "riverwide" cleanup of the LDW. The City also participated in sediment cleanups at the Norfolk and Diagonal/Duwamish outfalls to the LDW related to Natural Resource Damage (NRD) settlement commitments described later in this letter.

Sediment Source Control

Understanding the nature and extent of potential ongoing sources of contamination to the waterway is an essential component of a successful sediment cleanup. The City has an aggressive pollution source control program that inspects more than a thousand businesses that drain to the EW, traces pollution sources in the drainage and combined sewer systems, and conducts enforcement actions. The City has responded to 73 spills and 129 water quality complaints in the City-owned drainage system that discharges to the EW. As part of its efforts

to identify sources of pollution to the City-owned drainage system, the City has tested for pollution in over 190 solids samples collected from storm drains and combined sewers throughout the EW basin. Between 2004 and present, the City has cleaned more than 57,000 feet of storm drain lines that eventually discharge to the EW.

Habitat Restoration and Water Quality Improvements

The City is also a leader in NRD remediation in the EW and LDW. In 2008, the City passed legislation creating an innovative partnership between the City and a private entity called Bluefield Holdings. The company is leasing City property along the LDW and EW where it will restore habitat and then sell NRD credits to other parties to absolve their NRD liabilities. The Bluefield approach will improve the environmental health of these waterways and support the City's commitment to salmon recovery in the Green-Duwamish watershed. The City also reached a NRD settlement agreement in 1991 (together with King County Metro) that helped fund habitat restoration and significant sediment cleanups at the Norfolk and Diagonal/Duwamish outfalls in the LDW.

The City of Seattle conducts a variety of outreach and education to the public about stormwater management and the behaviors and actions that people can implement to improve water quality. These activities are publicized under the Protect Our Waters program which is the City of Seattle's commitment to take action and promote partnerships that protect and improve creeks, lakes, the Duwamish River (including the East and West Waterways) and Puget Sound.

Storm Water and Waste Water Management

A critical component of the long-term health of the EW is storm water and Combined Sewer Overflow (CSO) management. The City's storm water drainage system, which includes 460 miles of drains and ~34,000 catch basins, is regulated by the Phase I Municipal Stormwater Permit. The City is committed to meeting the requirements associated with the Phase I Permit including mapping; coordination; public participation; controlling runoff from development and construction sites; structural storm water controls; source control for existing development; illicit connections and illicit discharge detection and elimination; operation and maintenance; education and outreach; and monitoring.

The City is also investing in storm water facilities, retrofits, and an aggressive street sweeping program aimed directly at removing pollutant-containing particulate material (dirt) from the roads before it reaches the storm drain system. Through investigating and testing of technology, the City looks for the best means to retrofit its existing drainage system to improve stormwater quality. To date, the primary emphasis has been on integrating water quality treatment technology with the flood control capacity of projects. Two regional treatment systems have or will be developed in the LDW basin. The Norfolk/Martin Luther King Way Water Quality project has been completed. The South Park Pump Station and water quality facility is in the planning stages and is estimated to cost $30 million. Together, these two projects treat runoff from more than 450 acres.

The City's wastewater infrastructure consists of more than 400 miles of sanitary sewers, nearly 1,000 miles of combined sewers, 68 pump stations, and 85 permitted overflow points. Our 2015 Long Term Control Plan/Integrated Plan guides the City of Seattle's plan for reducing overflows from the combined sewer system into surrounding surface waters to meet the State Standard of one overflow per outfall per year on a 20-year rolling average. The City's one, small uncontrolled CSO that discharges to the EW is addressed by the current plan.

Puget Sound Partnership Goals

The City is an active proponent of the PSP, a broad-based effort to restore and protect Puget Sound mandated by the legislature as well as Governor Jay Inslee and overseen by a governor-appointed Leadership Council. All the City's commitments described in the paragraphs above support and advance the general or specific goals of the PSP Action Agenda. City senior policy staff participate in the South-Central Action Area Local Integrating Organization which identifies local actions necessary to restore and protect the Sound.

Social and Environmental Justice

The Duwamish valley is home to a diverse group of communities many of which face a variety of social and environmental stressors. The City is deeply committed to ending racism and race and social-based disparities in City government and the community. The City created The Seattle Race and Social Justice Initiative (RSJI), which is a citywide effort to eliminate racial disparities and achieve racial equity in Seattle.

Our Commitment

With the recommendations identified above, the City stands committed to ensuring a thorough and timely cleanup of the EW. As you consider this critical deliberative step in deciding a remedy for the East Waterway, I hope you find value in these recommendations. The City believes a remedy that reflects these recommendations will provide a cost-effective and protective solution within a sound adaptive management framework that allows cleanup to be tailored to location specific conditions. In this way, we can leverage and accelerate environmental improvements in the EW and its receiving water body, Puget Sound.

The City looks forward to a cleanup of East Waterway that protects people and the environment, preserves jobs and recreation, and provides a healthy place for fish and wildlife. We appreciate this opportunity to provide input to the NRRB and CSTAG, and thank you for considering the City's recommendations about this important decision.

Sincerely,

Madeline Fong Goddard, P.E.
Deputy Director
Drainage and Wastewater Line of Business
Seattle Public Utilities

Attachment – Memorandum, East Waterway Remedy Selection Recommendations

cc: Mami Hara, General Manager/CEO, Seattle Public Utilities
Jim Baggs, Interim General Manager/CEO, Seattle City Light
Shawn Blocker, U.S. EPA Region 10
Sheryl Bilbrey, Director, U.S. EPA Region 10 Office of Environmental Cleanup
Chris Hladick, Regional Administrator, U.S. EPA Region 10

King County
Department of Natural Resources and Parks
King Street Center, KSC-NR-0700
201 South Jackson Street
Seattle, WA 98104-3855

February 16, 2018

United States Environmental Protection Agency
National Remedy Review Board
c/o Ravi Sanga, ELC-111
1200 Sixth Avenue
Seattle, WA 98101

Dear Board Members:

Thank you for providing an opportunity for King County to submit its comments on a proposed East Waterway Superfund cleanup plan to the United States Environmental Protection Agency (EPA) National Remedy Review Board.

King County is the second-largest government in the state of Washington and the nation's 13th most populous county. Our responsibilities entail overseeing a wide range of regional services to protect the health, safety and quality of life for all of our 2.1 million residents.

Implementing a cleanup plan to address the historically contaminated sediment in the East Waterway and complete the larger Duwamish Waterway cleanup is one of our top environmental priorities. The decisions about the cleanup made by EPA will have wide reaching effects on the people who live and work in King County. I respectfully request your consideration of my comments on how a balanced approach to cleanup can protect and enhance the lives of our residents while protecting the vital economic and community interests of the people who live and work in the area.

King County is an active participant in the East Waterway Group (EWG), who, under EPA oversight, completed the Supplemental Remedial Investigation and developed the Feasibility Study for East Waterway Operable Unit of the Harbor Island Superfund site. I support the Group's detailed submittal to the Board, which lists several recommendations for the selection of the cleanup remedy.

The East Waterway Group's recommendations result in a shorter construction window and lower risks to workers performing the cleanup while also achieving all of the risk reduction targets in a shorter time period. The shorter construction window:

- Reduces the period of highest seafood exposures;
- Reduces construction related impacts and releases to the environment;

- Minimizes community health impacts;
- Reduces potential for worker accidents and fatalities; and
- Minimizes disruption to commerce.

The East Waterway Group's recommendations offer the greatest reduction in these negative effects. All the action alternatives require a large degree of dredging to accomplish cleanup goals due to the type of vessel use in East Waterway. Adding incrementally more dredging or conducting underpier dredging does not provide greater certainty that the cleanup objectives will be met.

Because all the alternatives ultimately reach the same risk reduction outcomes, King County recommends the selected cleanup be the one that minimizes risk to workers implementing the cleanup. Analyses presented in the Feasibility Study demonstrate that alternatives with more dredging take the longest to complete and have greater short-term impacts. Additional dredging also would release more contamination from the site to Elliott Bay and Puget Sound than a remedy that uses a balance of remedial technologies. Seafood tissue concentrations would remain elevated throughout dredging, meaning people consuming seafood from the East Waterway will not see any significant reductions in their risk until some period after dredging ceases. The longer the cleanup takes the greater the exposure of community members who consume seafood.

Based on information from a recent study on people who fish the Duwamish River system, the local fishing community includes various ethnic communities. King County promotes equity and social justice in its policies and decision making. We measure equity by the availability of jobs; affordable housing; education; safety; a healthy physical environment; and access to transportation, healthy food, healthcare and parks. The cleanup should not exacerbate the other equity and social justice challenges our fishing community from the Duwamish Valley already face. Selecting a remedy that completes cleanup construction faster for the same risk reduction would result in lowest impact to the fishing community.

The Duwamish Valley will also be directly affected by the broader impacts of the cleanup such as air emissions and dredged material transloading and transport. Residents there are already challenged by poor air quality, low health outcomes, and a disproportionate lack of access to basic services such as transit, retail stores and amenities such as parks. Here again, selecting a remedy that completes cleanup construction faster for the same risk reduction would result in lowest impact to that community.

I am also deeply concerned that a remedy with underpier dredging will pose greater health risks to the divers conducting that work than overall human health fish consumption risks that are reduced by the sediment cleanup. The underpier dredging considered in some alternatives is predicted to have much higher risk of fatal accidents than the use of other effective cleanup technologies. Because of these concerns, underpier dredging must only be used when absolutely necessary to achieve clear human health gains. As the Feasibility Study has demonstrated, this is not the case.

The agencies' cleanup decision is also extraordinarily important from an economic perspective. The area surrounding the East Waterway is a vital industrial corridor hosting about 100,000 jobs. An incredible eight percent of King County's jobs are located in the corridor, producing about $13.5 billion in annual economic output. These businesses and industries also support the creation of jobs in other economic sectors, such as retail, government, and services. Many of the jobs pay higher than average wages without requiring advanced education, providing opportunities for local community members. Any potential disruption is a significant concern and should be minimized.

From a regional perspective, it is important that the agencies select a plan that accomplishes the cleanup in the most cost-effective manner possible. That and a clear path to resolving the business community's liability concerns are necessary to protect and enhance the area's economic vitality while attaining environmental goals. We must meet our environmental responsibilities while addressing broader social needs such as education, transportation, and public safety. The Puget Sound Partnership has identified many priority actions for local government, such as stormwater control and habitat degradation that will require action on top of regulatory mandates such as increased controls of combined sewer overflows.

I would also like to stress King County's strong commitment to ongoing source control efforts that must continue if we are going to be successful in reducing contaminant concentrations in the East Waterway. The ability to control recontamination and protect our cleanup investment will require coordinated efforts by all parties state and local with regulatory authority in the East Waterway drainage basin.

For more than four decades, King County has worked to permanently remove industrial and domestic wastewater from the Green/Duwamish River, cumulatively reducing inputs by over 23 billion gallons per year. We have also reduced combined sewer overflows (CSOs) by 77 percent since 1990 to an average of 180 million gallons per year. Over the next several years, King County is committed to controlling its two CSOs in the East Waterway. The County will invest several hundred million dollars in additional CSO reduction in the East Waterway to further reduce remaining CSO inputs.

Additionally, we developed one of the first industrial waste programs in the country, and currently work with our partner cities in managing the largest local hazardous waste management program in the northwest. All these programs, along with the City of Seattle's stormwater programs, will continue to investigate and control pollutant sources to reduce inputs into the East Waterway. Our collective source control efforts will help ensure a successful cleanup.

King County has a tremendous stake in your decision. A successful cleanup has the potential to bring numerous health, environmental, social and economic benefits to the affected communities and the region. It can spur action around the broader efforts to restore and cleanup Puget Sound, attract investment in traditionally underserved communities, and

preserve a thriving and vibrant industrial core that provides regional economic benefits and livable wage jobs. I urge you to fully consider the merits of our recommendations.

If you would like more details behind the information in this letter, or have questions about our conclusions, please contact me at 206-477-4550 or email at christie.true@kingcounty.gov.

Sincerely,

Christie True, Director
Department of Natural Resources and Parks

cc: Chris Hladick, Region 10 Administrator, U.S. Environmental Protection Agency (EPA)
Sheryl Bilbrey, Director, Office of Environmental Cleanup, EPA

February 14, 2018

East Waterway Remedy Selection Recommendations

1 Introduction

The Final Feasibility Study (FS) for the East Waterway (EW) Operable Unit of the Harbor Island Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Superfund site was submitted to the U.S. Environmental Protection Agency (EPA) for approval in November 2017. The FS is the culmination of over a decade of site investigations, risk assessments, source characterization, modeling, and alternatives analysis. The FS was developed by the East Waterway Group (EWG; Port of Seattle, City of Seattle, and King County) in close coordination with EPA and incorporated input from stakeholders (Washington State agencies and affected tribes). EWG has worked cooperatively with EPA for years to keep this complex site on track.

As part of the remedy selection process, the National Remedy Review Board and the Contaminated Sediments Technical Advisory Group are reviewing Region 10's recommended remedial alternative in early 2018. EWG understands that Region 10 has identified a preferred remedy, but Region 10 has not yet communicated the preferred remedy to EWG. EWG prepared this memorandum to support the following three recommendations to be considered in EPA's identification of a preferred remedy:

1. The total polychlorinated biphenyl (PCB) remedial action level (RAL) of 12 milligrams per kilogram (mg/kg) organic carbon (OC) should be selected over the RAL of 7.5 mg/kg OC.
2. Underpier diver-assisted hydraulic dredging should not be a component of the preferred remedy.
3. A combination of open-water remedial technologies (i.e., dredging, capping, and enhanced natural recovery [ENR]) should be included in the preferred remedy.

In addition, this memorandum discusses how all FS action alternatives comply with the Washington State Sediment Management Standards (SMS) applicable or relevant and appropriate requirement (ARAR). As presented herein, these recommendations are also consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) rule (e.g., the CERCLA nine criteria analysis and cost-effectiveness evaluation), EPA guidance and planning documents (e.g., Remediating Contaminated Sediment Sites,[1] Principles for Managing Contaminated Sediment Risks [EPA's Principles],[2] and Superfund Task Force Recommendations[3]). EWG's recommendations emphasize

[1] EPA, 2017. *Memorandum Subject: Remediating Contaminated Sediment Sites - Clarification of Several Key Remedial Investigation/ Feasibility Study and Risk Management Recommendations, Updated Contaminated Sediment Technical Advisory Group Operating Procedure.* Mathy Stanislaus, Office of Land and Emergency Management, SEMS Doc ID 196834. January 9, 2017. Available at: https://semspub.epa.gov/work/HQ/196834.pdf

[2] EPA, 2005. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites.* Office of Solid Waste and Emergency Response. EPA-540-R-05-012, OSWER 9355.0-85. December 2005. Available at: https://semspub.epa.gov/work/HQ/174471.pdf

risk-reduction outcomes while minimizing construction impacts and uncertainty and fulfilling the CERCLA statutory requirement for cost-effectiveness.

The three recommendations are directly linked to how the remedial alternatives were developed. For reference, FS ES Table 3 (reproduced below) presents the nine action alternatives evaluated in the FS. The alphanumeric designations for the alternatives are keyed to the following three components:

- Open-water technology options, denoted by the alternative number (1, 2, or 3)
- Underpier technology options (referred to as "restricted access areas" in the table), denoted by alternative letter (A, B, C+, or E)
- RAL sets, denoted by the RAL for total PCBs in mg/kg OC placed in parentheses ((12) or (7.5))

Additional details on each of these three components are discussed in Sections 2, 3, and 4 of this memorandum. SMS ARAR compliance is discussed in Section 5.

FS ES Table 3
Retained Alternatives and Alternative Key

Action Alternatives	Technologies for Open-water Areas	Technologies for Restricted Access Areas (Underpier and Low Bridges)	PCBs RAL All Areas
No Action			
1A(12)	1. Removal with capping and ENR where applicable	A MNR	(12) 12 mg/kg OC
1B(12)		B In situ treatment	
1C+(12)		C+ Diver-assisted hydraulic dredging followed by in situ treatment for PCBs or mercury > CSL; in situ treatment elsewhere	
2B(12)	2. Removal with capping where applicable	B In situ treatment	
2C+(12)		C+ Diver-assisted hydraulic dredging followed by in situ treatment for PCBs or mercury > CSL; in situ treatment elsewhere	
3B(12)	3. Maximum removal to the extent practicable	B In situ treatment	
3C+(12)		C+ Diver-assisted hydraulic dredging followed by in situ treatment for PCBs or mercury > CSL; in situ treatment elsewhere	
2C+(7.5)	2. Removal with capping where applicable		(7.5) 7.5 mg/kg OC
3E(7.5)	3. Maximum removal to the extent practicable	E Diver-assisted hydraulic dredging followed by in situ treatment	

Notes:
CSL – cleanup screening level
ENR – enhanced natural recovery
mg/kg – milligrams per kilogram
MNR – monitored natural recovery
OC – organic carbon
PCB – polychlorinated biphenyl
RAL – remedial action level

[3] EPA, 2017. *Superfund Task Force Recommendations.* EPA, July 25, 2017. Available at: https://www.epa.gov/sites/production/files/2017-07/documents/superfund_task_force_report.pdf

2 Remedial Action Level for Total PCBs

2.1 Review of Remedial Action Level Sets

The RAL sets were developed for 12 contaminants[4] (see FS Section 6), summarized as follows:

- **RAL set (12):** This RAL set was developed to achieve remedial action objectives (RAOs) for all 32 risk-driver contaminants (see FS ES Table 2). This RAL set is denoted by the total PCB RAL of 12 mg/kg OC and results in the active remediation of 121 of 156 acres of the EW (78%). This total PCB RAL is equivalent to the RAL for the selected remedy in the adjacent Lower Duwamish Waterway (LDW) CERCLA Superfund site.
- **RAL set (7.5):** This RAL set expands the remediation footprint by using a total PCB RAL of 7.5 mg/kg OC to evaluate the effect of remediating to lower concentrations for that risk-driver chemical. The RALs for the other contaminants are the same as for RAL set (12). RAL set (7.5) results in the active remediation of 132 acres of the EW (85%).

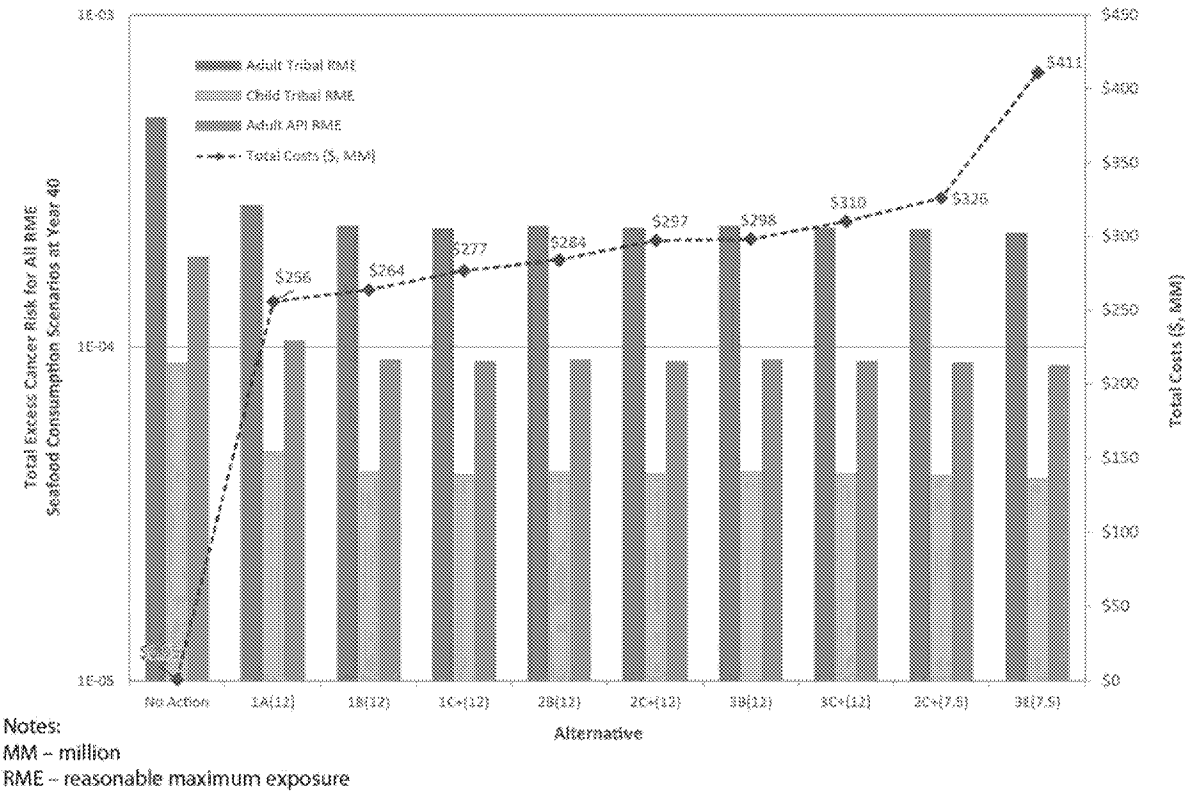
2.2 Comparison of Total PCBs Remedial Action Level Options

This section discusses differences between the results of applying RAL set (12) and RAL set (7.5), focusing on remedy effectiveness (i.e., risk reduction), short-term impacts, uncertainty, and recontamination potential.

Predictive modeling demonstrates that **additional remediation associated with RAL set (7.5) does not result in additional risk reduction**. As summarized in FS ES Figure 11 (reproduced below), the human-health risk outcomes (i.e., RAO 1) are the same for all action alternatives except Alternative 1A(12), resulting in no predicted difference between the RAL set (12) and (7.5) alternatives. Long-term risks for the other RAOs are also the same for Alternatives 1B(12) through 3E(7.5), as summarized in FS ES Table 4.

[4] RALs were developed for total PCBs, dioxins/furans, arsenic, carcinogenic polycyclic aromatic hydrocarbons, tributyltin, 1,4-dichlorobenzene, butylbenzylphthalate, acenaphthene, fluoranthene, fluorene, mercury, and phenanthrene.

FS ES Figure 11
Long-Term Risks and Costs for the Alternatives



Notes:
MM = million
RME = reasonable maximum exposure

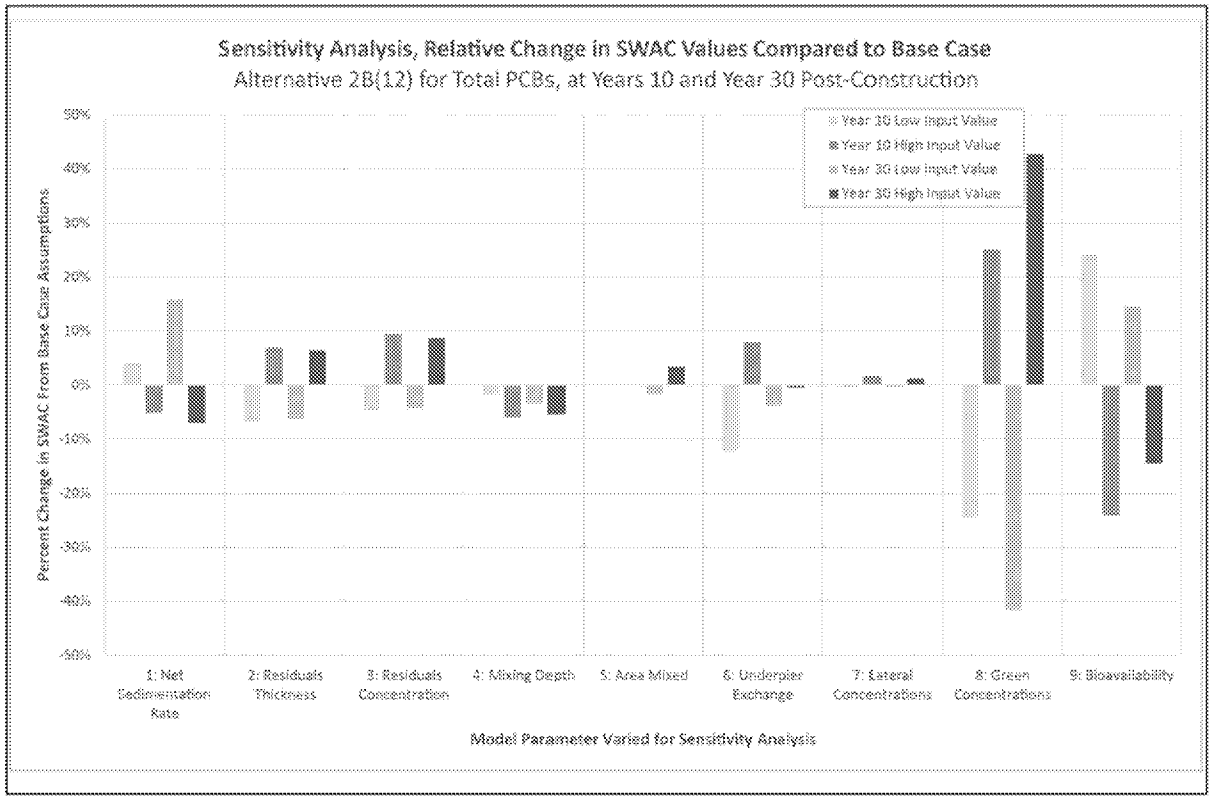
The 7.5 mg/kg OC total PCB RAL results in incrementally higher short-term impacts and costs. By remediating an additional 11 acres of the waterway (7%; primarily by removal), the RAL set (7.5) alternatives result in short-term impacts by adding another construction season and $29 million in cost to complete construction.[5] This results in additional short-term impacts that include construction impacts (e.g., releases to the water column during dredging and air emissions from equipment) and longer time to achieve RAOs (see FS ES Table 4). These impacts and costs come without providing any additional long-term benefit to human health or to the environment.

The 7.5 mg/kg OC total PCB RAL does not improve the certainty that the remedy will achieve the predicted risk reductions. Consistent with EPA's Principles that recommend evaluation of site model uncertainties, an extensive sensitivity analysis evaluated the influence of key processes in the EW on the predicted long-term spatially weighted average concentration of total PCBs for the remedial alternatives. The most sensitive parameter was the concentration of total PCBs in incoming sediment from the upstream Green River, which varied the predicted spatially-weighted average concentrations (SWACs) by up to +/-40% in 30 years following remediation (FS Appendix J Figure 4b, reproduced

[5] $29 million is based on the difference in cost between Alternatives 2C+(12) and 2C+(7.5).

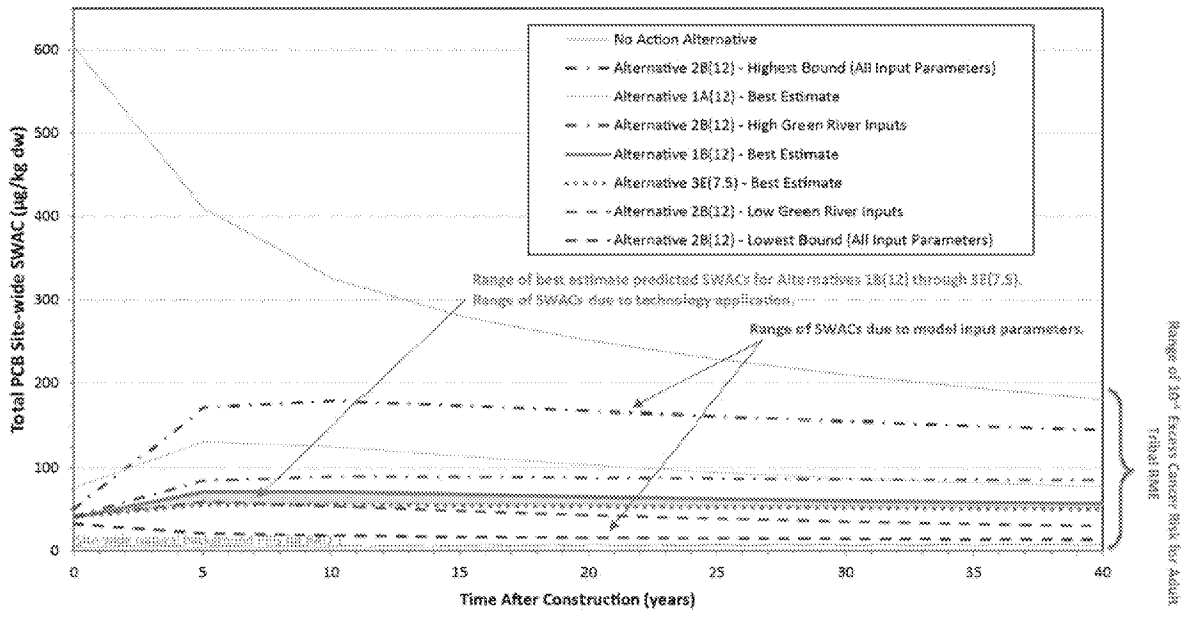
below). This parameter affects the RAL set (12) and (7.5) alternatives equally, because incoming sediment affects all areas of the waterway. Because of this and the behavior of other sensitivity parameters (e.g., net sedimentation rate), the RAL set does not have a meaningful impact on the range of uncertainty in long-term SWACs.

FS Appendix J Figure 4b
Sensitivity Analysis, Relative Change in SWAC Values Compared to Base Case, Alternative 2B(12)



FS Figure 11-5 (reproduced below) illustrates this point in a different way, showing that the variation in total PCB SWAC among different alternatives (i.e., from employing different total PCB RALs and remedial technologies) is much smaller than the variation resulting from high and low sensitivity parameters (i.e., from varying sensitivity parameters and keeping the alternative constant). In the figure, the green shaded area represents the variation among Alternatives 2B(12) through 3E(7.5), which results in a narrow range of total PCB concentrations. The purple dashed lines show the variation in the high and low bounding model runs (i.e., sensitivity parameters) for Alternative 2B(12), which results in a wider range of concentrations. Therefore, the technology combination of the alternatives (if limited to Alternatives 2B(12) through 3E(7.5)) has less bearing on the final SWAC outcomes than model input uncertainties. The figure also shows that all SWAC predictions, regardless of alternative or sensitivity parameter, result in the same human health risk outcomes (i.e., same risk range).

FS Figure 11-5
Predicted Site-Wide Total PCB SWACs Over Time for Action Alternatives



Notes:
µg/kg = microgram per kilogram; dw = dry weight; PRG = preliminary remediation goal; RAO = remedial action objective; RME = reasonable maximum exposure; SWAC = spatially-weighted average concentration

The 7.5 mg/kg OC total PCB RAL may not be practicable to maintain. The 7.5 mg/kg OC total PCBs RAL would increase the chance that localized areas would exceed the RAL, either during the construction period, when as yet un-remediated EW sediments are being redistributed by vessel traffic, or after construction, when controlled urban sources are more likely to cause exceedances of this lower RAL. A RAL (and hence a "recontamination" threshold) of 7.5 mg/kg OC total PCBs could result in the need to re-remediate areas, with potentially substantial costs and no added benefit. The 12 mg/kg OC total PCB RAL is consistent with other sediment cleanup sites in Puget Sound, in particular, the adjacent LDW CERCLA Superfund site.

3 Underpier Diver-Assisted Hydraulic Dredging

3.1 Review of Underpier Technology Options

Despite comprising only 14 acres of the EW (9%), the underpier technology component is responsible for a substantial portion of the differences in cost-effectiveness between the alternatives, due to the extreme difficulty of remediating underpier sediments. The underpier options are described in FS Section 8.2.1.2 and consist of the following:

- **Option A – monitored natural recovery (MNR):** Natural recovery in the underpier area when coupled with active remediation in adjacent, open-water areas.

- **Option B – in situ treatment:** Placing a thin layer of treatment material, such as activated carbon, in areas above RALs, to reduce the bioavailability of hydrophobic organic contaminants. Material would likely be cast from near the water surface by Telebelt™ or a similar technology.
- **Option C+ – diver-assisted hydraulic dredging where total PCBs or mercury are greater than the Washington State SMS marine benthic cleanup screening level (CSL) followed by in situ treatment in the areas that were dredged; in situ treatment elsewhere:** Dredging to remove sediment in an estimated 2 acres of underpier area that exceed the CSL, in addition to Option B (in situ treatment everywhere exceeding RALs).
- **Option E – diver-assisted hydraulic dredging, followed by in situ treatment:** Dredging to remove sediment over the entire underpier area exceeding RALs followed by in situ treatment.

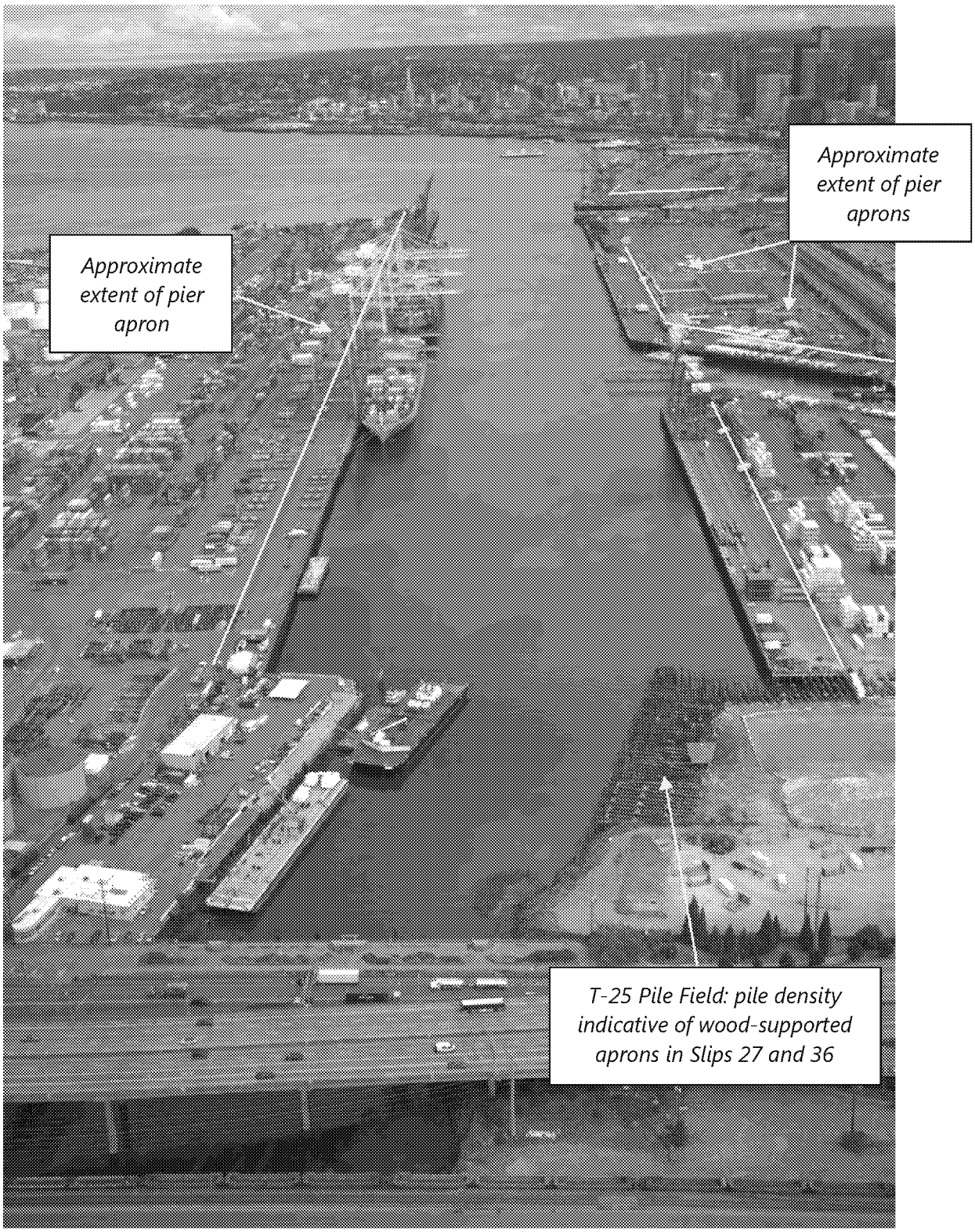
The rest of this section focuses on the challenges and the predicted outcomes of diver-assisted hydraulic dredging, particularly in the context of comparing underpier Options B and C+.

3.2 Diver Safety

There are considerable health and safety risks associated with commercial diving. An average of 6 to 13 commercial diving fatalities occur each year, which corresponds to a risk of between 28 and 50 deaths per 1,000 workers over a working lifetime of 45 years (see FS Section 7.2.6.3).[6] The commercial diving fatality rate is 15 times larger compared to other construction equipment operators,[7] which results in greater than double the probability of a construction fatality during sediment removal for Option C+ alternatives compared to Option B alternatives, based on an estimated 2 seasons (175 days) of diver-assisted dredging (see FS Appendix I, Part 2, Table 2).[8] The risk would be even higher for Option E. The reality of these risks is evident by recent commercial diver deaths in Puget Sound. Moreover, the dive conditions in the EW are considered more hazardous than in other locations due to deep water (more than 50 feet) with limited visibility; the presence of dense piling, cross-bracing, and debris; and frequent vessel traffic.

[6] osha.gov. Commercial Diving Safety. Available at: http://www.osha.gov/archive/oshinfo/priorities/diving.html.
[7] 0.0011 fatalities per diver per year, compared to 0.000075 fatalities per worker per year (see Appendix I, Part 2, Table 2).
[8] 0.0017 predicted fatalities during removal for Alternative 1B(12), compared to 0.0040 predicted fatalities during removal for Alternative 1C+(12) (see Appendix I, Part 2, Table 2).

Photograph 1. Aerial photograph of the East Waterway with the approximate extent of the pier aprons. Water depths are over 50 feet at most pier faces.



Workplace accident statistics were removed from the comparative analysis of the alternatives (e.g., from FS Table 10-1) at EPA's direction. However, EWG believes that when such high-risk construction activities are being compared to lower risk alternatives, worker safety risk is an extremely important consideration under the CERCLA short-term effectiveness criterion and an essential consideration for identifying a preferred remedy.

3.3 Diver-Assisted Hydraulic Dredging Does Not Reduce Risk

Predictive modeling shows that **additional removal by diver-assisted hydraulic dredging does not result in additional risk reduction**. As discussed in the RAL comparison above, the predicted human-health (i.e., RAO 1) risk outcomes are the same for all of the action alternatives except Alternative 1A(12) (see FS ES Figure 11, reproduced above). Furthermore, the long-term risk outcomes for the other RAOs are also the same for Alternatives 1B(12) through 3E(7.5), as summarized in FS ES Table 4.

3.4 Implementability Challenges with Diver-Assisted Hydraulic Dredging

The implementability and short-term effectiveness challenges are significantly different between the alternatives that use diver-assisted hydraulic dredging and those that do not. The challenges of diver-assisted hydraulic dredging are as follows:

- **Challenging sediment conditions** will slow production rates and result in contaminated sediment left behind. Challenging sediment conditions include the following:
  - Steep slopes (1.75H:1V in most areas) composed of large riprap and difficult-to-reach interstices resulting in incomplete removal of contaminated sediment.
  - Debris, such as cables, large wood, and broken piles, making dredging more difficult, increasing the amount of contaminated sediment that is left behind, and increasing diver hazards.
  - Dense piling and cross-bracing that increases the complexity of dredging operations.
- **Challenging diving conditions** will slow production rates and put divers at risk. Challenging diving conditions include the following:
  - Deep water (more than 50 feet), limiting dive time for each diver and potentially requiring the use of decompression chambers (as required by commercial diving regulations), and requiring a large team of divers to complete the work.
  - Limited access because of the configuration of the piers as long continuous docks with access only from the face of the dock (e.g., see FS Figures 2-4a through 2-4d, 2-9, and 2-10).
  - Low visibility because of shade from the pier, water depth, and suspended sediments, making the work more challenging and hazardous. Visibility will be lowest when LDW flow rates are highest, typically during the winter storm conditions, which coincide with much of the in-water work window.
  - Dense distribution of pilings and cross-bracing, requiring relocation of both floating and submerged air and dredging production lines into and out of each row of piles. In

addition, this density reduces the ability of a diver to quickly escape the work area in an emergency, or for the safety diver to quickly reach the diver holding the dredging equipment.

- **Working in an active waterway** will require coordination with commercial shipping schedules and will limit upland staging. EW berthing areas average around 300 container ship calls per year and 600 total vessel calls per year. The impacts of underpier removal in a busy terminal include the following:
  - Diving schedules are likely to be significantly impacted by waterway activities, as divers will need to be protected from propeller wash and suction forces from transiting and berthing container ships.
  - Business interruption is more likely because of diver-assisted hydraulic dredging compared to open-water dredging because of restricted access to areas where divers are performing underwater work.

Barge-mounted water treatment will be necessary. Hydraulic dredging generates large quantities of water that must be treated prior to discharge back to the waterway. Upland areas are not available for storage of generated water, sediment settling, effluent treatment, testing, and discharge because of port operations at existing terminals. Therefore, generated water will need to be handled using a portable barge-mounted treatment system, complicating hydraulic dredging operations and potentially limiting production rates.

Photograph 2. Example photograph of Terminal 18 pier structure and associated dense piles and dark conditions.

3.5 Diver-Assisted Dredging Will Not Reduce Uncertainty

As discussed in Section 2.2, the most sensitive modelling parameter is the chemical concentration in incoming Green River sediment (FS Appendix J, Figure 4b, reproduced above). This parameter would

affect all underpier options to the same degree, because incoming sediment affects all areas of the waterway. Similarly, the differences in predicted total PCB SWACs by varying technologies (from Alternative 2B(12) through 3E(7.5), which include underpier Options B, C+, and E) are small compared to the differences in predicted SWACs by varying modeling parameters (see FS Figure 11-5, reproduced above).

It is important to note that the model-predicted concentrations and associated risks consider underpier sediment stability, consistent with EPA's Principles. As highlighted in the EW conceptual site model (see FS ES Figure 6), sediment mixing by propeller wash is an important process in the EW and was incorporated into the predictive modeling completed for the FS. For the base case (i.e., best-estimate) model parameters, 25% of underpier sediments were assumed to be exchanged (based on propeller wash forces) with open-water sediments every 5 years. Moreover, when underpier sediments were considered to be more or less stable (i.e., increasing underpier exchange to 50% or decreasing underpier exchange to 5%, respectively), the resulting total PCB SWACs were similar to the base case (FS Appendix J Figure 4b, reproduced above), showing that the sensitivity of the total PCB SWACs to underpier exchange was less than other parameters in the long term. Therefore, sediment stability under piers (i.e., underpier exchange) had a minor impact compared to other sensitivity parameters.

Moreover, the implementability challenges that diver-assisted hydraulic dredging would encounter (see Section 3.4) increase the likelihood that underpier hydraulic dredging will leave substantial amounts of residual contaminated sediment behind. While in situ treatment also has uncertainty regarding effectiveness, this uncertainty is better mitigated through an iterative approach in a risk-based framework, consistent with EPA's Principles, in the form of monitoring and adaptive management rather than pre-emptive removal by diver-assisted hydraulic dredging.

3.6 Diver Assisted Hydraulic Dredging Is Not Cost-Effective

A statutory requirement that must be addressed in the Record of Decision and supported by the FS is that the remedial action must be cost-effective (40 CFR 300.430(f)(1)(ii)(D)). Diver-assisted dredging over the estimated 2 acres identified for Option C+ increases costs by $13 million[9] greater than Option B, without providing additional risk reduction or reducing uncertainty. Diver-assisted dredging for Option E would increase the cost by $80 million,[10] again without additional risk reduction or reduced uncertainty.

Consistent with the nearby Bremerton Naval Shipyard Pilot,[11] in situ treatment is cost-effective for remediating underpier sediments.

[9] $13 million is the difference in cost between Alternatives 1B(12) and 1C+(12), as shown in FS ES Figure 11.
[10] $80 million is the marginal cost to add diver-assisted hydraulic dredging, based on the cost estimate in FS Appendix E.
[11] Kirtay V., G. Rosen, M. Colvin, J. Guerrero, L. Hsu, E. Arias, R.K. Johnston, B. Chadwick, J. Arblaster, M. Grover, J. Conder, V. Mager, R. Webb, J. Collins, J. Germano, and A. Conrad, 2017. *Demonstration of In Situ Treatment with Reactive Amendments for*

4 Open-Water Technologies

4.1 Review of Open-Water Technology Options for Alternatives

The open-water area comprises most of the site (142 acres of the EW, or 91%). Due to site use restrictions (i.e., requirements to maintain navigation depths), the three open-water technology options all rely primarily on sediment removal (dredging) to remediate sediments. However, to the extent practicable, a range of open-water technology options was developed for the remedial alternatives (see FS Section 8.2.1.1), consistent with site conditions and site uses, as follows:

- **Option 1: Removal with capping and ENR where applicable.** This option relies on removal (77 acres)[12] but maximizes the use of capping (13 acres) and ENR (18 acres). Capping is viable in areas with sufficient water depth to construct a cap below navigation requirements (after partial dredging, to the extent necessary). ENR is in areas with relatively low concentrations and sufficient water depth, such that placed ENR material is below navigation requirements (after partial dredging, to the extent necessary).
- **Option 2: Removal with capping where applicable.** This option relies on removal (94 acres) but maximizes the use of capping (13 acres) where viable. ENR use is minimal (3 acres). Like Option 1, capping is viable in areas with sufficient water depth to construct a cap below navigation requirements (after partial dredging, to the extent necessary).
- **Option 3: Maximum removal to the extent practicable.** This option maximizes the use of removal (100 acres) and minimizes the use of capping (7 acres) and ENR (1 acre).

4.2 Comparison of Open-Water Technology Options

The open-water remedial options were developed to provide a range of technology options and target remedial technologies to applicable areas of the site. Active alternatives with any of the open-water technology options achieve protection of human health and the environment; however, alternatives with Options 1 and 2 use a wider combination of remedial technologies, consistent with the remedy selection considerations in EPA *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*, 2005.[13]

The results of predictive modeling showed that **additional removal by dredging did not result in any additional risk reduction in the long term**. As noted above, the human-health risk outcomes were the same for all alternatives except Alternative 1A(12), and there was no difference between the open-water technologies 1, 2, and 3 in the different remedial alternatives (e.g., by comparing Alternatives 1B(12), 2B(12), and 3B(12); FS ES Figure 11, reproduced above).

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[12] Areas listed in these bullets are for the (12) RAL set alternatives, for reference.

[13] EPA, 2005. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*. Office of Solid Waste and Emergency Response. EPA-540-R-05-012, OSWER 9355.0-85. December 2005. Available at: https://semspub.epa.gov/work/HQ/174471.pdf

Additional removal results in incrementally higher short-term impacts and costs. By removing an additional 90,000 to 150,000 cubic yards of material for the Option 2 and 3 alternatives, respectively, the alternatives result in short-term impacts from additional construction time and $20 million to $34 million in additional cost.[14] Additional short-term impacts include construction impacts (e.g., releases to the water column during dredging that increase fish tissue concentrations, air quality), and longer time to achieve RAOs (see FS ES Table 4). These impacts and costs come without any benefit to human health or the environment, as discussed above.

Additional removal does not improve the certainty that the remedy will achieve the predicted risk reductions. The key conclusions from the sensitivity analysis are discussed in Sections 2.2 and 3.5. Similar to the other alternative components, the predicted total PCB SWACs are more sensitive to uncertainty in other waterway conditions (e.g., incoming concentrations of upstream Green River sediment) than to the variation in the open-water technology (FS Figure 11-5, reproduced above). Furthermore, because sediment stability is a key consideration for sediment sites (e.g., risk management principle No. 4 [EPA 2005]), it is important to note that sediment stability was factored into the modeling and sensitivity analysis. Sediment stability was demonstrated to have a minor effect on long-term total PCB SWACs compared to other sensitivity parameters (Appendix J, Figure 4b, reproduced above).

Alternatives with open-water Option 1 or 2 offer better cost-effectiveness than Option 3 because of similar risk reduction, but lower short-term impacts and costs.

5 Washington State Sediment Management Standards Compliance

Contaminated sediment sites in Washington State are regulated under the SMS, which are a key ARAR for the EW. The FS was developed to meet SMS requirements and was reviewed by Washington State Department of Ecology (Ecology). In particular, the Preliminary Remediation Goals (PRGs) were developed to comply with SMS (see FS Section 4). An important component of the FS is a description of how the EW cleanup will comply with SMS, even though some PRGs are not likely to be attained by the alternatives (see FS Appendix A and FS Sections 4.3.1 and 9.1.1.2). The rest of this section summarizes how the EW cleanup is in compliance with specific aspects of the SMS rule.

For total PCBs and dioxins/furans, human-health PRGs were developed based on natural background concentrations. These PRGs are not predicted to be achieved by any of the alternatives, primarily diffuse nonpoint sources upstream of the EW. However, where it is not technically possible to meet and maintain natural background levels, the SMS allow upward adjustment up to "regional background" levels that are determined by Ecology. The regional background levels are based on sediment concentrations that are the result of diffuse sources of contamination (including

[14] $20 million is the difference in cost between Alternatives 1B(12) and 2B(12), and $34 million is the difference between Alternatives 1B(12) and 3B(12), as shown in FS ES Figure 11.

stormwater). Although Ecology has not yet established regional background concentrations for the geographic area that includes the EW, EWG and EPA have elected to move forward with the FS in the interest of making progress on the cleanup. Because the PRGs for total PCBs and dioxins/furans remain set at natural background levels, long-term compliance with the SMS ARAR will likely rely on future adjustments of the cleanup levels, consistent with the SMS.

Considering the SMS provisions, all action alternatives meet the threshold criterion of compliance with the SMS ARAR. The following text, from FS Section 9.1.1.2, has been developed in coordination with EPA:

> None of the action alternatives are predicted to achieve the natural background PRGs for RAO 1 for PCBs or dioxins/furans, due to model input parameters that assume ongoing contribution from contaminants from diffuse nonpoint sources upstream of the EW. Although the SMS allow for use of a regional background-based cleanup level if it is not technically possible to meet and maintain natural background levels, regional background levels have not yet been established for the geographic area of the EW.
>
> However, CERCLA compliance with MTCA/SMS ARARs may be attained if:
>
> - Post-remedy monitoring demonstrates sediment concentrations are much lower than FS predictions, and PRGs identified in this FS are attained in a reasonable restoration timeframe.
> - Sediment Cleanup Levels are adjusted upward once regional background levels are established for the geographic area of the EW, and are attained in a reasonable restoration timeframe, consistent with SMS requirements.
>
> In either case, the restoration timeframe needed to meet the cleanup levels could be extended beyond 10 years, consistent with the substantive requirements of a Sediment Recovery Zone (SRZ) as defined in the SMS[15] (see Section 4.3.1 and Appendix A).
>
> Following remediation and long-term monitoring, if EPA determines that no additional practicable actions can be implemented under CERCLA to meet certain MTCA/SMS ARARs, EPA may issue a ROD Amendment or ESD providing the basis for a TI waiver for specified MTCA/SMS ARARs under Section 121(d)(4) of CERCLA.

To summarize, all the action alternatives meet the threshold requirement of compliance with SMS. Long-term continued compliance will be achieved by either meeting the PRGs or by adjusting the PRGs upward, consistent with SMS requirements. The restoration timeframe may be longer than 10 years, consistent with SMS requirements. Finally, EPA may elect to use a technical impracticability waiver for specific aspects of the SMS rule.

[15] As discussed in Appendix A, an SRZ is used to track a cleanup area with a restoration timeframe longer than 10 years. The requirements of an SRZ (WAC 173-204-590(2)) are consistent with the CERCLA requirements for cleanup and source control, and would be substantively met through various components of the CERCLA remedy (e.g., the long-term monitoring and 5-year review framework, and the alternatives analysis, comparison, and selection process).

6 Conclusions

This memorandum identifies recommendations the EWG strongly believes should be considered in in EPA's identification of a preferred remedy for the EW. Three of these recommendations are reflected in the alternative rankings for the CERCLA balancing criteria shown in FS ES Figure 12 (reproduced below). The following trends, consistent with the discussions above, can be observed in the figure:

- Alternatives based on the lower total PCB RAL (RAL set (7.5)) rank the same for long-term effectiveness and permanence as alternatives with higher total PCB RAL (RAL set (12)), but rank lower for short-term effectiveness and cost than alternatives with RAL set (12).
- C+ alternatives with an estimated 2 acres of underpier, diver-assisted hydraulic dredging rank the same for long-term effectiveness and permanence as alternatives with only placement of in situ treatment in underpier areas (B alternatives), but generally rank lower for short-term effectiveness, implementability, and cost.
- Alternatives with more open-water sediment removal rank similar for long-term effectiveness and permanence, but generally rank lower for short-term effectiveness, implementability, and cost.

In addition, all action alternatives meet threshold criteria and comply with the SMS ARAR (Section 5).

As discussed in FS Section 11.1.8, cost-effectiveness is an NCP requirement for selecting a preferred remedy. In general, the benefits among the action alternatives (particularly human-health risk reduction) do not increase with higher costs; therefore, the lower-cost alternatives tend to be more cost-effective.

In addition to CERCLA balancing criteria, the recommendations presented by EWG are also consistent with EPA guidance and planning documents and the Superfund Task Force Recommendations:

- Consistency with other sites in Puget Sound, particularly in the selection of a RAL of 12 mg/kg OC for total PCBs, which is consistent with the LDW CERCLA Superfund site, and in the selection of in situ treatment under piers, which is consistent with Bremerton Naval Shipyard site.[16]
- Consistency with reducing risks as soon as possible, with preference for alternatives with fewer construction impacts, shorter time to achieve RAOs, and use of an optimization of remedial technologies that are targeted in appropriate areas of the EW. In particular, EWG believes that diver-assisted dredging should not be selected, because short-term risks (worker safety) are too high, without any impact on site-wide risk reduction. In situ treatment will reduce site risks more rapidly than diver-assisted dredging.
- Consistency with an adaptive management framework to manage uncertainty. In particular, underpier sediments, which are challenging to remediate and have a high degree of uncertainty, could be remediated with in situ treatment and followed by a robust monitoring program.

[16] Kirtay V., G. Rosen, M. Colvin, J. Guerrero, L. Hsu, E. Arias, R.K. Johnston, B. Chadwick, J. Arblaster, M. Grover, J. Conder, V. Mager, R. Webb, J. Collins, J. Germano, and A. Conrad, 2017. *Demonstration of In Situ Treatment with Reactive Amendments for Contaminated Sediments in Active DoD Harbors Final Report* – Project ER-201131. Submitted to: Environmental Security Technology Certification Program. Submitted by: Space and Naval Warfare Systems Center Pacific Project Team. January 2017.

FS ES Figure 12
CERCLA Comparative Analysis of Alternatives

	Achieve Threshold Criteria?	Long-term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short-term Effectiveness	Implementability	Cost
No Action	No	●	●	●	●	●
1A(12)	Yes	●	●	●	●	●
1B(12)	Yes	●	●	●	●	●
1C+(12)	Yes	●	●	●	●	●
2B(12)	Yes	●	●	●	●	●
2C+(12)	Yes	●	●	●	●	●
3B(12)	Yes	●	●	●	●	●
3C+(12)	Yes	●	●	●	●	●
2C+(7.5)	Yes	●	●	●	●	●
3E(7.5)	Yes	●	●	●	●	●

● Ranks very high compared to other alternatives
● Ranks relatively high compared to other alternatives
● Ranks moderate compared to other alternatives
● Ranks low-moderate compared to other alternatives
● Ranks low compared to other alternatives

Notes:
Low costs are given a high rank, and high costs are given a low rank.
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act